

# The Effect of Dietary Pollen on the Health and Behaviour of Honey Bees

Ben Jones, National Bee Unit, Fera and University of Exeter



Caged honey bees are provided with *ad libitum* access to both mixed pollen and syrup. Cages are kept in constant darkness at 36 °C and 60 per cent humidity to mimic colony conditions.

**T**he development and maintenance of honey bee colonies depends on adequate nutrition. In order to maintain healthy colonies, it is essential that they receive sufficient nutrition of the correct type (nutritional value) to promote their continuous survival. Previous trials suggest that the addition of pollen in the diet of adult honey bees could enhance immunity, suggesting a link between nutrition and immune function. However, the impacts of the components of dietary pollen on the honey bee immune system remain poorly understood.

My PhD is investigating this knowledge gap, joint supervised by Dr James Cresswell at the University of Exeter and Dr Giles Budge at Fera.

## Research Tools and Methods

During the first year of my PhD, 2012, my work focused on the development and optimisation of the research tools

and methods I would need to complete my research. The bulk of experimental work was focused on investigating the dynamics of the immune system of honey bees in order to establish a framework to work within. I was able to establish the temporal dynamics of three immune responses in honey bees, antimicrobial peptide activity (AMP's), activity of glucose oxidase (GOX) and phenoloxidase activity (PO).

## Laboratory Trials

In 2013, I ran laboratory based trials to investigate how pollen availability impacts the immune system in honey bees challenged with an immune elicitor (Lipopolysaccharides or LPS). In order to gain a comprehensive understanding of the immune response, multiple parameters of immunity at both the personal (PO and AMP activity) and social level (GOX activity) were measured over two time points in cohorts of caged honey bees that were provided with pollen or were pollen starved.

My trials in 2014 were aimed at investigating the role of essential amino acids in immune function. I spent the entire 2014 season undertaking numerous laboratory trials to investigate how honey bees regulate their uptake of essential amino acids and any health benefits incurred from uptake of dietary essential amino acids.

## Field Trials

Throughout 2015, I ran field trials to investigate how the behaviour observed in my feeding trials translates into realistic colony conditions. Using radio frequency tagged bees I obtained data on over 10,000 foraging flights. The data will now be analysed to better understand the links between immunity, feeding behaviour and foraging activity. I intend to submit my results for publication in the scientific and beekeeping journals and I continue to enjoy researching this fascinating field. My research will help inform beekeepers how the diet of honey bees affects the health of their colonies. □